



# Thallium Sensor

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UNIVERSITY OF  
PITTSBURGH  
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# Why Thallium?

- The Poisoner's Poison
- Extracting other metals from ore
- Specialized industries
- Novel addition to iGEM database

1

IA

2

IIA

3

IIIB

4

IVB

5

VB

6

VIB

7

VII B

8

VIII

9

VIII

10

VIII

11

IB

12

IIB

13

IIIA

14

IVA

15

VA

16

VIA

17

VIIA

18

VIII  
8A

1

H

Hydrogen

1.008

3

Li

Lithium

6.941

11

Na

Sodium

22.990

19

K

Potassium

39.098

37

Rb

Rubidium

84.468

55

Cs

Cesium

132.905

87

Fr

Francium

223.029

4

Be

Beryllium

9.012

12

Mg

Magnesium

24.305

20

Ca

Calcium

40.078

38

Sr

Strontium

87.62

56

Ba

Barium

137.328

88

Ra

Radium

226.025

21

Sc

Scandium

44.956

39

Y

Yttrium

88.906

57-71

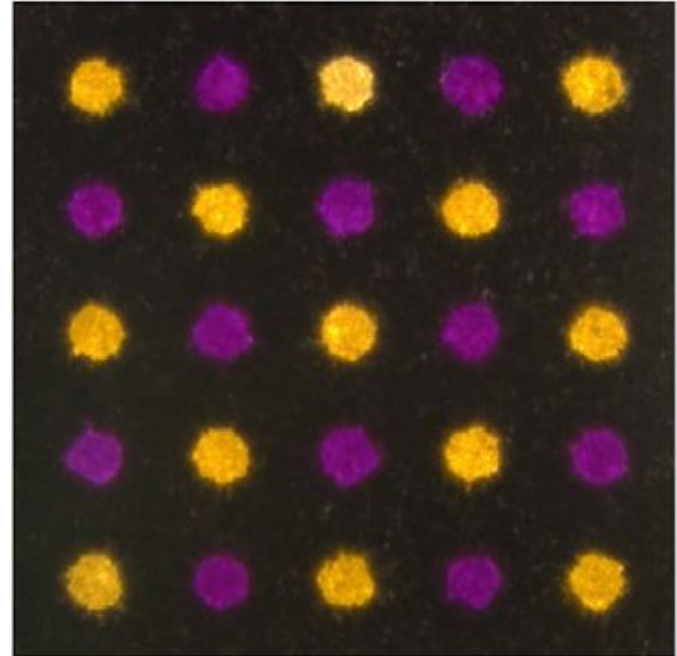
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# Cell-Free and Paper-Based

Based off Collins *et al.*, 2014

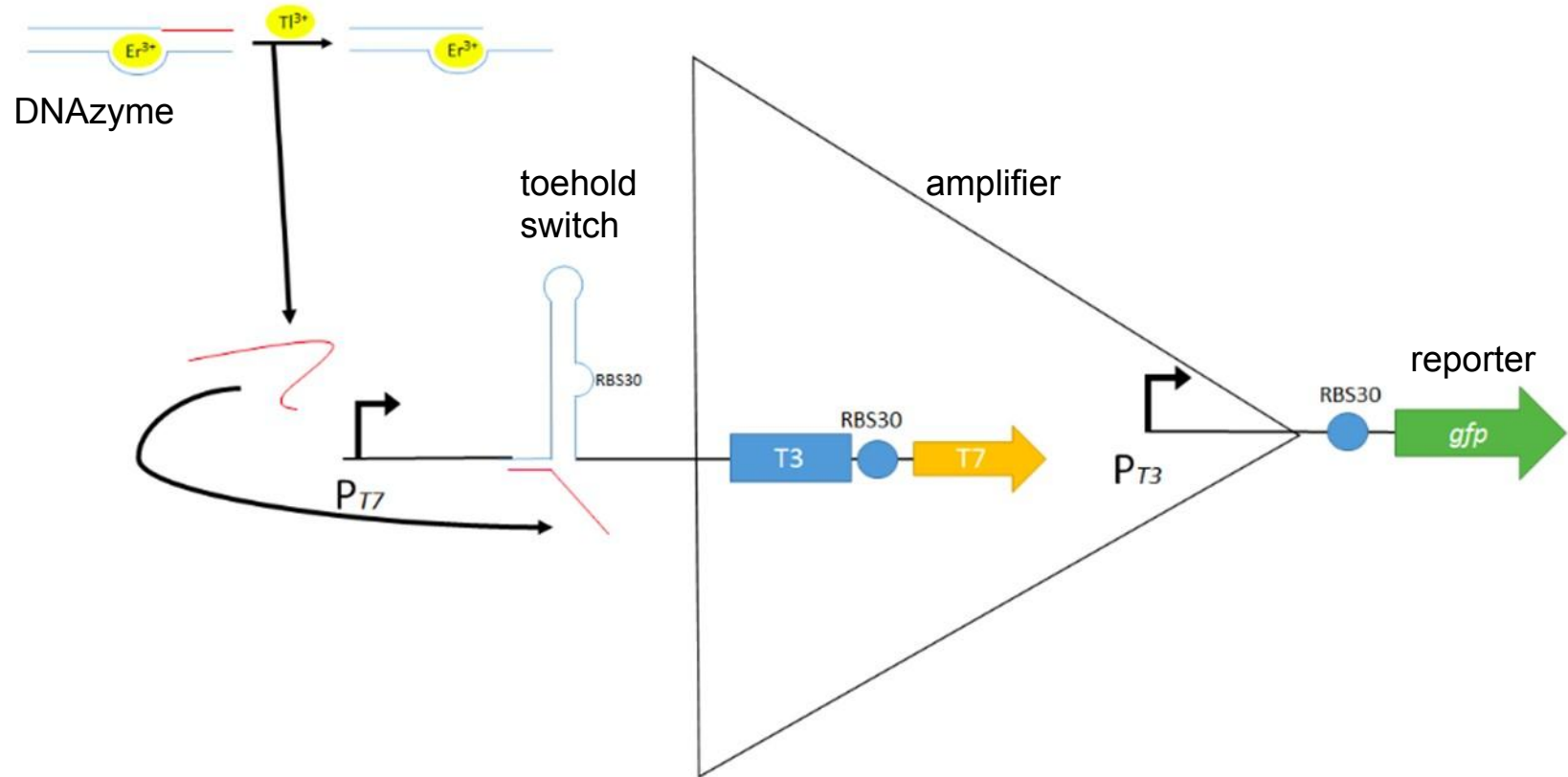
## Advantages

- Cheaper
- Time
- Easier to Use

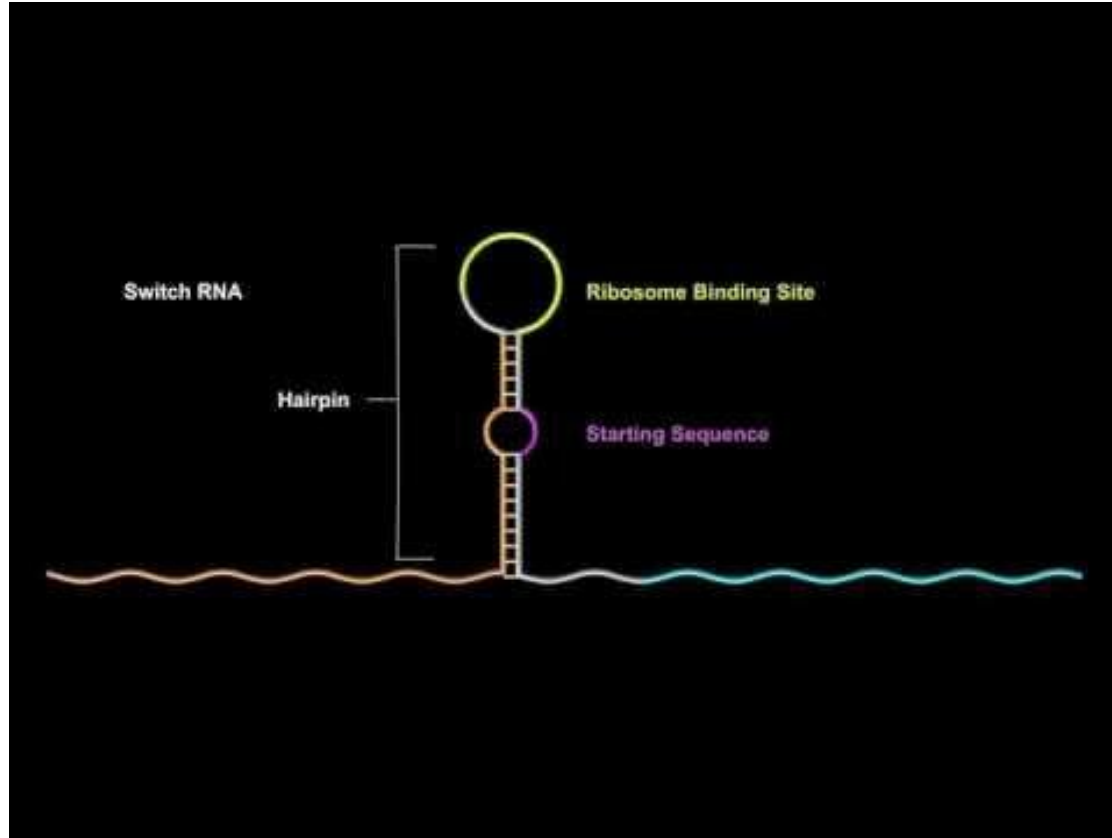


(Pardee *et al.*, 2014)

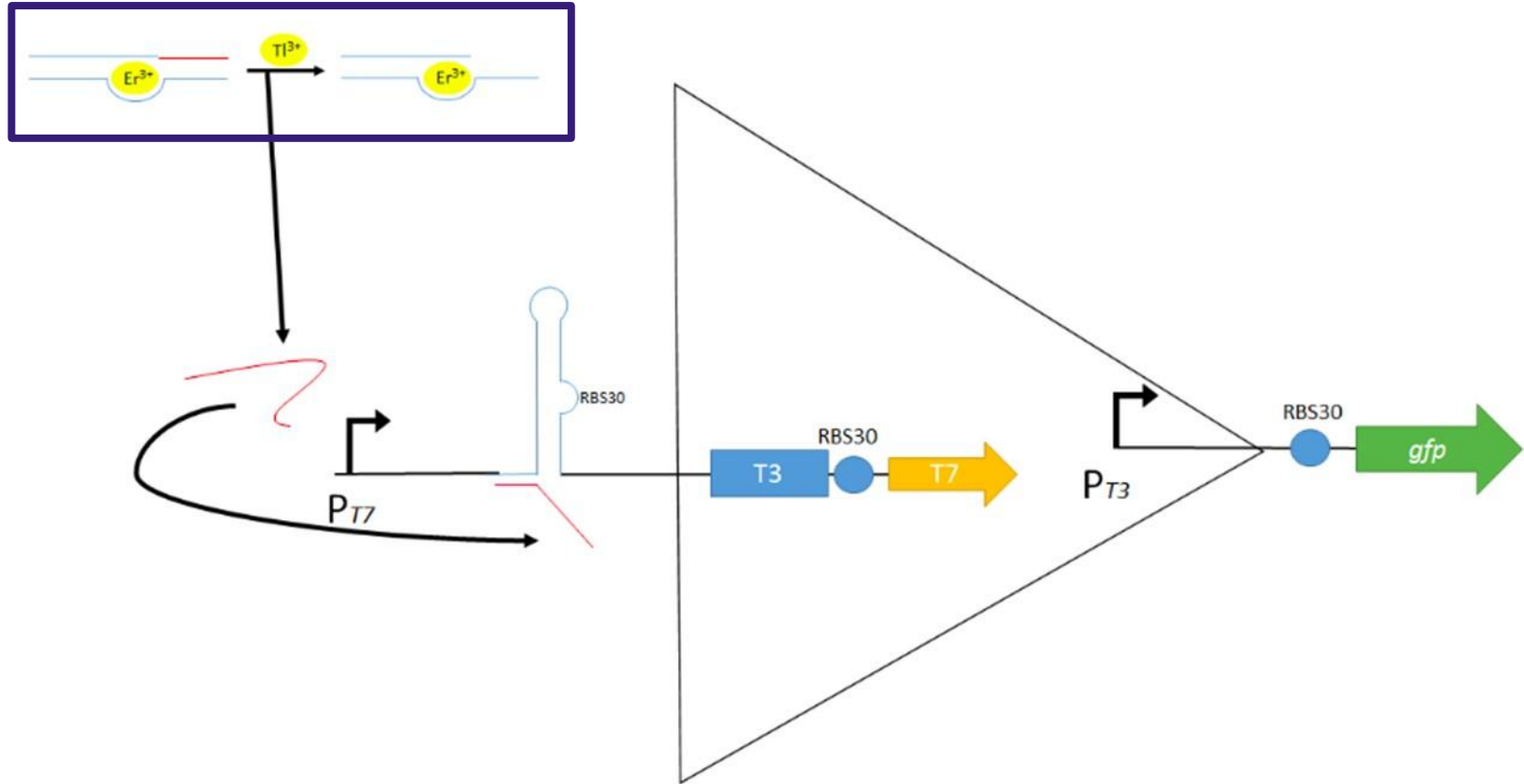
# Detection Circuit



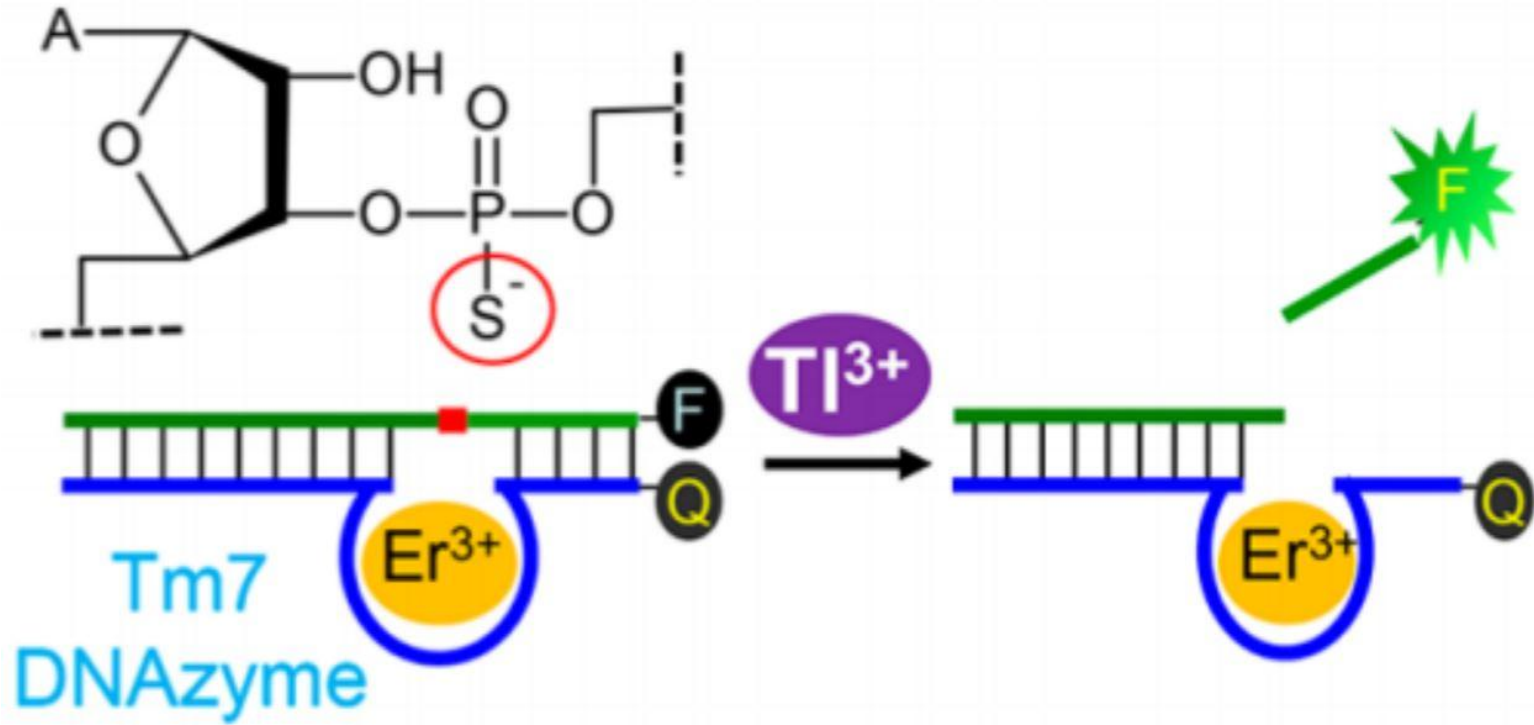
# Toehold Switch



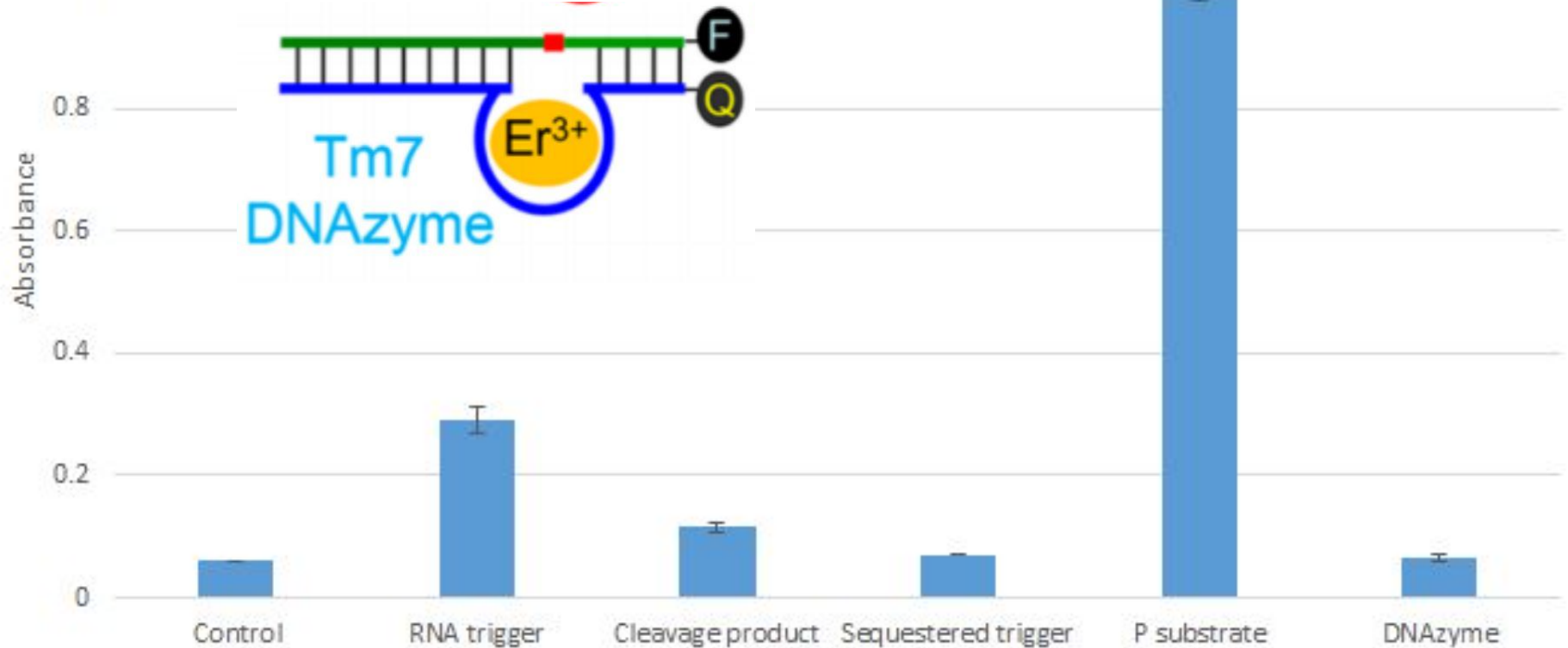
# DNAzyme



# DNAzyme

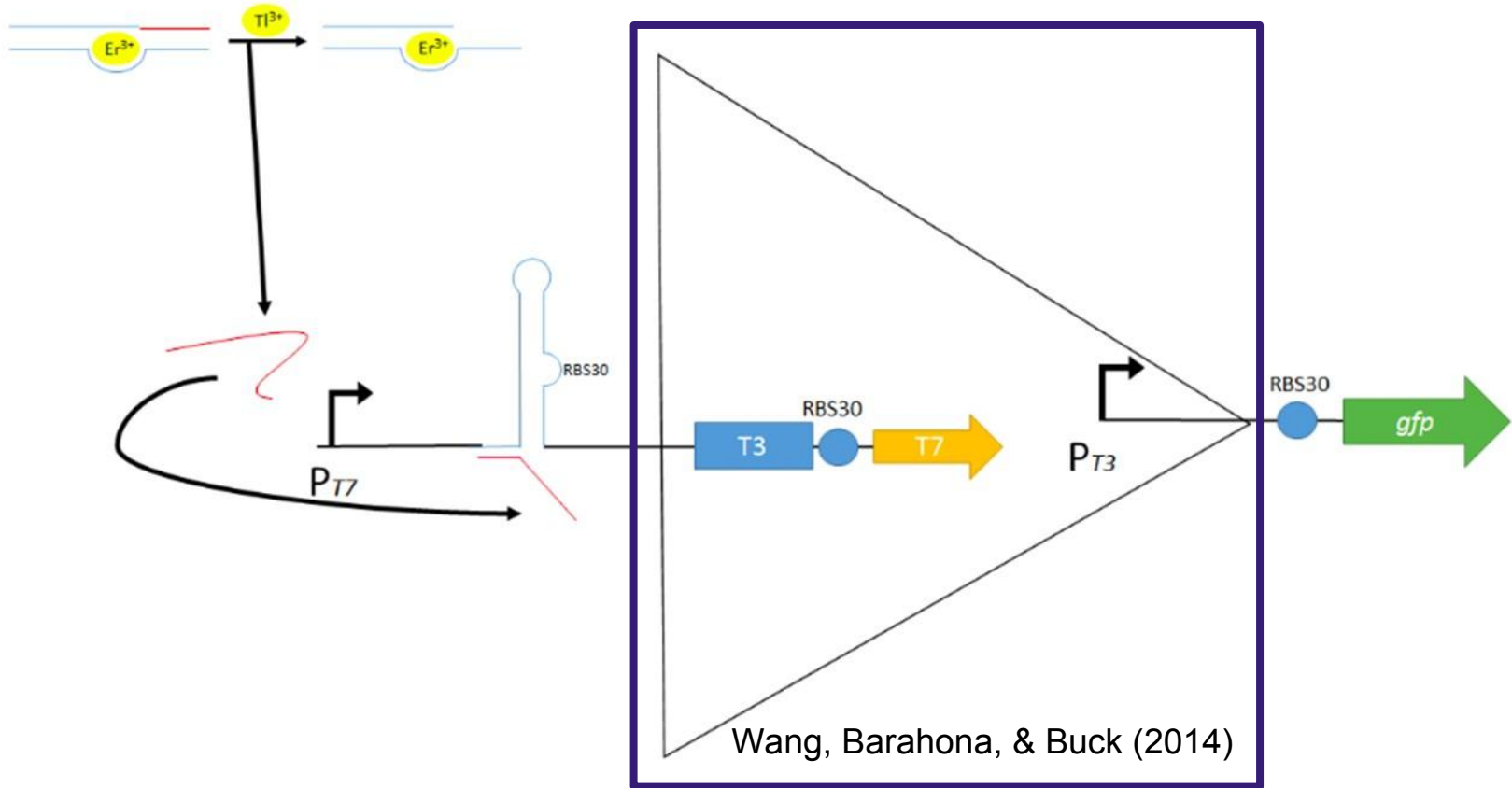


# Toehold LacZ Expression with Various Triggers



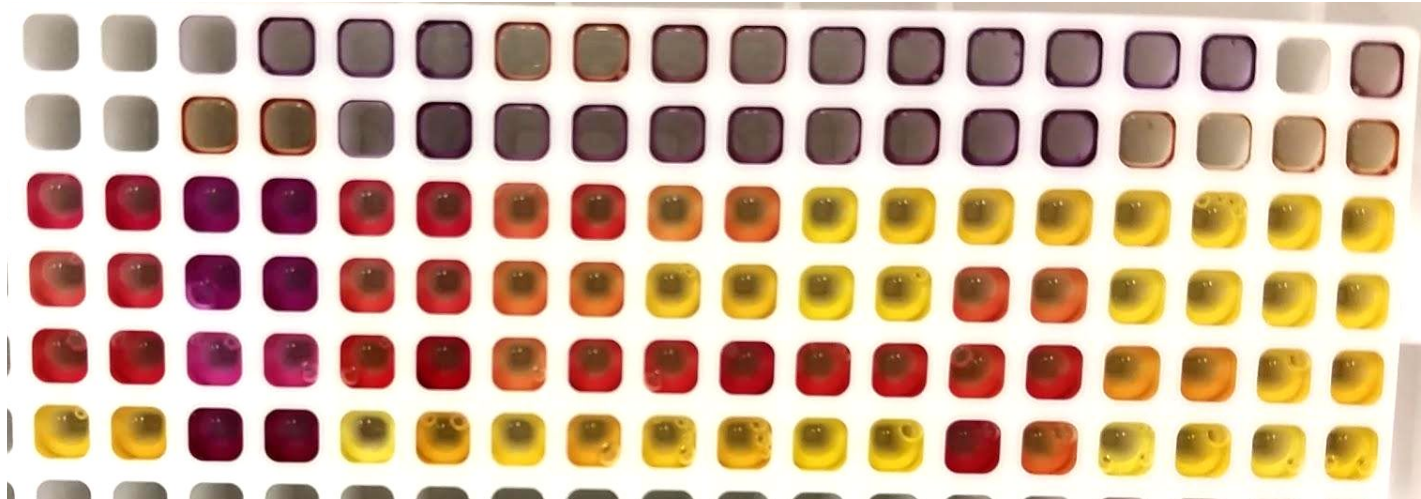


# Amplifier



# Reporter

- amilCP (Uppsala Sweden, iGEM 2012)
- lacZ
- eGFP



# References

- Huang, P. J., Vazin, M., & Liu, J. (2015). Desulfurization activated phosphorothioate DNAzyme for the detection of thallium. *Analytical Chemistry*, 87(20), 10443.
- Pardee, K., Green, A. A., Ferrante, T., Cameron, D. E., DaleyKeyser, A., Yin, P., & Collins, J. J. (2014). Paper-based synthetic gene networks. *Cell*, 159(4), 940-954. doi:10.1016/j.cell.2014.10.004
- Wang, B., Barahona, M., & Buck, M. (2014). Engineering modular and tunable genetic amplifiers for scaling transcriptional signals in cascaded gene networks. *Nucleic Acids Research*, 42(14), 9484-9492. doi:10.1093/nar/gku593

# Collaborations

- Test bacterial devices in cell-free systems!

# Contact Us!

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